MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

SUPPLEMENTARY EXAMINATION

TRIMESTER 1, 2015/2016 SESSION

EEL4116 – POWER STATIONS

(LE)

19 NOV 2015
2.30 PM – 4.30 PM
(2 HOURS)

INSTRUCTION TO STUDENT

1. This Question Paper consists of 3 pages with 4 Questions only.

2. Answer **ALL** questions. All questions carry equal marks and the distribution of marks for each question is given.

3. Please print all your answers in the Answer Booklet provided.

Question 1

(a) A power plant has the following annual factors:
Load factor = 0.75
Capacity factor = 0.60
Use factor = 0.65.
Maximum demand is 60 MW.
Calculate
(i) the annual energy production
(ii) the reserve capacity over and above the peak load
(iii) the hours during which the plant is not in service per year. [8 marks]

(b) A hydro plant and a steam plant are to supply a constant load of 90 MW for one week (168 h). The steam plant cost is expressed as

$$F(Ps) = 53.25 + 11.27\,Ps + 0.0213\,Ps^2$$

Where Ps is in MW and F is the cost in an arbitrary unit. Let the hydro plant be limited to 10,000 MWh of energy. Find the optimal hydrothermal scheduling. [10 marks]

(c) A power station has 4 units of 75 MW each, and its loads cycles are:
- 260 MW for 6 hours
- 200 MW for 8 hours
- 160 MW for 4 hours
- 100 MW for 6 hours

Calculate the load factor and the capacity factor from the above data. [7 marks]

Question 2

(a) State the four processes in the Rankine cycle. [8 marks]

(b) A generating plant has the following data on an ideal Rankine cycle:
- Heat energy at the input to the pump, h_1=191.83 kJ/kg
- Heat energy at the input to the turbine, h_3 = 3445.3 kJ/kg
- Heat energy at the input to the condenser, h_4 = 2420.4 kJ/kg

The work done by the water pump is considered negligible.
Calculate the following:
(i) the heat energy wasted in the condenser
(ii) the cycle efficiency. [9 marks]

(c) With the help of a diagram, explain the Ring busbar with the circuit breakers arrangement. [8 marks]

Continued...

Question 3

(a) Explain the basic principle of differential busbar protection. Discuss the effect of CT saturation on the protection. [10 marks]

(b) An industry has a maximum demand of 1200 kW and a load factor of 0.5. It buys electricity from a power supplier at the rate of RM 35 per kW plus RM 0.25 per kWh of energy consumed. Calculate the following:

(i) the annual electricity bill of the industry

(ii) the saving in energy charges if the load factor of the industry is improved to 80%, without altering the annual energy consumption.

[9 marks]

Answer either c or d

(c) Without help of any digaram, explain only in words about recolsers.

(d) Without help of any diagram, explain only in words about sectionlizers

[6 marks]

Question 4

(a) Name 5 conventional generating plants which convert kinds of energy into electrical energy. [5 marks]

(b) Plot a schematic arrangement of a modern steam power plat, indicate its elements and briefly explain each element used in power plant. [12 marks]

(c) The initial invested cost for equipment of a power plant is RM 1.5×10^8. The useful life of the equipment is 30 years and its salvage value is 8.0% of its total cost. Calculate the amount of yearly investment to be deposited for replacement, by straight-line method, and by sinking-fund method. Assume that the annual compound interest is 5.0%. [8 marks]

End of paper.